Clay-Organic Molecule Interactions: Oxidation of Acetaldehyde by Montmorillonite in N_2 Atmosphere at Room Temperature

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Abstract: Oxidation of acetaldehyde molecules adsorbed on Na- and Mg-Wyoming montmorillonite at room temperature (20 – 25 ° C) and in N_2 atmosphere has been studied by I.R. spectroscopy. A comparison between clay-acetic acid complex and that prepared from acetaldehyde is given. The influence of the nature of the saturating cation as well as the clay pretreatment on this oxidation process are discussed and reaction pathways are proposed. Acetic acid directly adsorbed on the clay surface is almost removed at 110 ° C, while that produced from the oxidation of the adsorbed acetaldehyde appears to be strongly held. Within a temperature range 180 – 230 ° C, the fixed acetic acid molecules dissociate to acetate form; then occurs an interaction of the acetate and the residual acid with the lattice OH of the clay at 200 – 300 ° C. This interaction involves the loss of the structural OH and deposition of carbon on the clay surfaces. The thermal decomposition1 of the residual complex is almost completed at 500 – 600 ° C.

Key Words: Acetaldehyde • Acetate • Adsorption • Montmorillonite • Oxidation

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